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THE
Journal of the Society of Arts,
AND OF
THE INSTITUTIONS IN UNION.

111th Session.] FRIDAY, OCTOBER 20, 1865. [No. 674. Vol. XIII.

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Proceedings of the Society.

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Musical Education Committee.

The following report was drawn up in the Ministry of Public Education in Prussia, and has been received, through Earl Russell, from Her Majesty's Ambassador at Berlin:—

PRUSSIA.

The study of music in Prussia enjoys a considerable range, in consequence of the numerous private establishments, whose founders and managers do that which in many other states is done by public academies (*conservatoires*) at the expense of the State. Of such private establishments there are, for example, the Conservatoire of Music of Dr. Stern, the new Musical Academy of Professor Rullack, the Singing Academy, under the direction of Professor Grell, in Berlin, as well as the Conservatoire of Music in Cologne, founded by a company (*Verein*) of friends of music, which is under the Director of Music, Herr Hiller. There is no want of similar private institutions in other larger provincial towns. No official reports are made upon them. Occasional reports are made in the programme of the Stern and Rullack establishments. Till now there has been no State conservatoire for music in Prussia, and state money has only been exceptionally applied to such musical educational establishments, and more frequently for the support of extraordinary talents. With reference to the government provision for musical students, the Senate of the Berlin Academy of Arts has a section, whose members, Messieurs Bach, Grell, and Taubert, conduct the musical division of the Academy. The annual cost of this division, in which instruction is given in the theory of music and the art of composition, amounts to about 1,800 thalers. The number of pupils is not fixed.

In the Royal Institute of Church Music at Berlin, under the direction of Professor Bach, with four teachers, instruction is given to twenty pupils in organ playing, pianoforte playing, violin and singing, gratis, as well as in the theory and the history of music. The annual expense of this institution amounts to 2,897 thalers.

One academical musical institute exists at the Royal University at Breslau, having one director and two teachers, with salaries amounting to 450 dollars, and a similar one at Königsberg, with two teachers. Other universities have likewise offices of teachers of music.

Singing forms an element of education, at gymnasia schools, and other educational establishments. Instruction in music, that is, in organ playing, pianoforte playing. violin playing, and singing, is given in the school-teachers' seminaries, at which the organists and choristers are educated, theoretically and practically, in music. Besides the above-named teaching schools of this character, there is a formation school for singing for the persons belonging to the cathedral choir (*dom choir*), and one for singing and instrumental music at the Royal Opera.

Berlin, the 5th July, 1865.

For the Minister of Public Education,
(Signed) Lehnert.

To His Excellency Monsieur de Bismarck.

Proceedings of Institutions.

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South Staffordshire Educational Association.—The sixth annual meeting was held on the 4th October, under the auspices of the Willenhall Literary Institution, which last year invited the Society to pay a visit to Willenhall. Lord Lyttelton, who has been the President of the Association from its establishment, presided, and was supported by the Earl of Lichfield. The following delegates from Institutions were present:—Stourbridge Ironworks Institute, Mr. George Hipwood, Mr. Robert Bill. Messrs. Chance's Library, Mr. F. Talbot. West Bromwich Christian Institute, Mr. Henry Ward. Wednesbury Mechanics' Institute, Mr. Sampson Lloyd, and Mr. R. Williams. Wednesbury Working Men's Club, Mr. Weimpress and Mr. Davies. Bilston Working Men's Club, Mr. John Hague. Bilston Institute, Rev. J. W. Bain and Mr. J. C. Tildesley. Willenhall Literary Institute, Mr. Chapelle. Dudley Geographical Society, Mr. H. Beckett and Mr. James Solly. Dudley Mechanics' Institute, Mr. E. Hollier, Mr. A. Shedden, and Mr. J. Williams. Pensnett Night School and Club, Rev. C. Farmer and Mr. Atkins. Woodside Mutual Improvement Society, Mr. Crompton. Cradley Heath Working Men's Club, Mr. Tromans. Corngreaves School, Mr. S. Griffiths. Gold's Hill, Rev. F. P. B. Hutton and Mr. Crabtree. Stourbridge Associated Institute, Rev. D. McGinnis, and Mr. W. Ryder. Kinver Young Men's Institute, Mr. Thomas Bolton, Mr. W. Yeomans, and Mr. B. Williams. Wolverhampton St. Peter's Night School, Rev. J. H. Iles. Walsall Church Institute, Mr. Vaughan and Mr. Webb. Wolverhampton Working Men's Club, Mr. Powell and Mr. Wilkins. Oldbury Working Men's Club, Mr. Spencer. Mr. Jones, the secretary of the Association, read the report, of which the following is the substance:—"During the greater portion of the past year the operations of the Association have been carried on under considerable disadvantages, and the actual results of the past season are not, on the whole, so satisfactory as they have been in some previous years. At the time of the last annual meeting, the district was agitated by one of the severest labour disputes on record, and this was barely settled before a somewhat similar disturbance took place in another branch of the staple industries of the locality. The natural results of these contests between masters and men had the effect of diverting the attention of each body from any movement of a philanthropic or educational character. It is, however, highly satisfactory to find that, notwithstanding these adverse circumstances, institutions and evening schools were able to hold their ground, and the gross results of the year's work are much higher than might have been expected. After describing the Willenhall Institute building, recently opened, the report says the number of members has increased from 150 to nearly 400. At Brierley-hill, a public company has been formed for the purpose of erecting suitable institute accommodation, and the buildings are in active progress. At Oldbury, a Working Men's Club has been commenced, and is reported in a satisfactory condition. The Athenæum of Wolverhampton has been considerably enlarged, a commodious reading-room has been formed, and, as an amalgamation has been made between this society and the Alliance Literary Institute in the same town, the total number of members has greatly increased during the year. The St. John's Working Men's Club, Wolverhampton, has been in active and successful work throughout the whole year. On the other hand, the reports received from several institutions are of an unsatisfactory nature. The Wolverhampton Working Men's College has been suspended, owing to lack of students; and thus one of the most useful agencies in the district has, for a time at least, ceased its operations, which have been carried on with the most gratifying results for upwards of eight years. The Alliance Literary Institute and Christian Association, in the same town, has also broken up. Several other societies report that it is with difficulty that they have been able to keep open their doors at all, and state that if, in the approaching season, they are not more successful, they will be compelled to close. Though the general work carried on by institutions was not, on the whole, of a satisfactory nature last year, it is pleasing to note the number of evening schools throughout the district increased. The examinations carried on by the Association have been this year attended by a smaller number of candidates than last year. This diminution is from evening schools, and arises from the fact that the pupils from the Dudley Mechanics' Institution and the Amblecote Night School were examined by means of the Worcestershire Union Local Boards, though they worked the same papers. Several institutions are in union with both Unions of Institutes, and can elect to be examined by either. The total number attending the elementary examinations was this year 122, and of these 72 were placed upon the class list. The examiner states that he is able to report favourably of the quality of the answers of those candidates who have been successful; the best are very good indeed, and the whole of the first class in each grade are praiseworthy. For the Society of Arts final examinations the number of successful candidates was this year 54, but among these none obtained the distinction of a prize. The examinations of the Science and Art Department were attended by upwards of 50 students, and of these more than 40 were placed on the class list. Certain modifications having been suggested in the method of distributing the prizes and certificates to the successful candidates, it has been resolved, should it be approved at this meeting, to merely give out the local certificates, &c., at the place where the annual meeting is held, but to send the others to each examination centre, and to request the local board in each place to organise a public distribution meeting. As representations have been made from the managers of evening schools, &c., that a considerable stimulus would be given to the members preparing for the examinations were prizes offered to the candidates appearing at the head of each class list, the committee have resolved to expend a sum not exceeding £20 in such prizes at the examinations to be held in March next. With respect to the future work of the Association, it is proposed to hold during the winter a series of meetings somewhat similar to the one referred to as having been held at Wednesbury in February last. Arrangements have been made to have a conference and public meeting at Bilston, in November; and the committee suggest to managers of institutions the great desirability of having such meetings annually, at the commencement of the winter season. They also propose to hold during the winter several meetings of secretaries, in order to obtain frequent interchange of opinion upon the most important matters affecting institution work, and to issue occasional papers, in which the proceedings of the associated institutions will be briefly recorded. In giving effect to these proposals, the active co-operation of the managers of institutions is particularly invited, as without their zealous assistance and united action throughout the whole district they can hardly expect that what they are intending to do will be successful. The committee hope that by these and other means the institutions of the district may be encouraged to more energetic action during the present winter, and that at the next meeting of the Association the reports presented may be of a more uniformly satisfactory character than they have been for the past season."

EXAMINATION PAPERS, 1865.

(*Continued from page* 682.)

The following are the Examination Papers set in the various subjects at the Society's Final Examinations, held in April, 1865:—

SPANISH.

THREE HOURS ALLOWED.

Part I.

Candidates for the First-class Certificate will have to translate the following passage into Spanish, to render into English or French the idiomatic phrases, and to write a short essay:—

Lope de Vega is called a prodigy of nature, and such he really may be reckoned, not that we can ascribe to him a sublime genius, or a mind abounding with fine original thought; but his fertility of invention and readiness of versifying are beyond competition. He required no more than four-and-twenty hours to write a versified drama of three acts, interspersed with sonnets, and abounding in intrigue. This astonishing facility enabled him to supply the Spanish theatre with more than two thousand original dramas. In general the theatrical manager carried away what he wrote before he had even time to revise it; and immediately a fresh applicant would arrive to prevail on him to commence a new piece. According to his own opinion he wrote on an average five sheets a-day, so that he must have written upwards of 21,300,000 verses.

This peculiar gift of rapid composition will appear more extraordinary when we attend to the nature of Lope's versification. At every step we meet with acrostics, echoes, and compositions of that perverted and laborious kind, which, though they require no genius, exact much time that one should think such a voluminous poet could little afford to waste.—*Hallam's History of Europe.*

Chistes.

Translate into English—El rey Don Alonso de Aragon decia que cinco cosas le agradaban mucho; lena seca para quemar; caballo viejo para cabalgar, vino anejo para beber, amigos ancianos para conversar, y libros antiguos para leer.

Un letrado leyendo un libro de secretos naturales en que decia que el hombre que tiene la barba ancha era senal de muy necio, tomó una vela en la mano para mirarse á un espejo, porque era de noche, y quemóse por descuido la mitad dela barba, y escribió luego al margen, Probatum est.

IDIOMS.

1. Ladrar contra la luna.
2. Dorar la pildora.
3. Piedra que rueda no coje musgo.
4. Buscar cinco pies al gato.
5. Tener un pie en la sepultura.
6. Dar palo de ciego.
7. Al buen entendedor pocas palabras.
8. Despedirse á la francesa.
9. Nó hay que mentar la soga en casa del ahorcado.
10. Por el dinero baila el perro.
11. En el pais de los ciegos el tuerto es el rey.
12. Hacer el caldo gordo.

PART II.

Candidates for the Second-class Certificate will have to translate six or seven of the above idioms, the following extract of Gil Blas, and the examples for the elucidation of grammatical questions:—

Blas de Santillana, mi padre, despues de haber servido muchos anos en los ejercitos de la monarquia Espanola, se retiró al lugar donde habia nacido. Casóse con una aldeana, y yo naci al mundo diez meses despues que se habian casado. Pasáronse á vivir á Oviedo, donde mi madre se acomodó por ama de gobierno, y mi padre por escudero. Como no tenian mas bienes que su salario, corria gran riesgo mi educacion de no haber sido la mejor, si Dios no me hubiere deparado un tio que era canonigo de aquella Iglesia. Llamabase Gil Perez, era hermano mayor de mi madre, y habia sido mi padrino. Figurate allá en tu imagination, lector mio, un hombre pequeno, de tres pies y medio de estatura, extraordinariamente gordo y con la cabeza zabullida entre los hombros, y hé aqui la vera efigie de mi tio. Por lo demas era un eclesiastico que solo pensaba en darse buena vida, quiero decir, en comer y tratarse bien para lo creal la suministraba suficientemente la renta de su prevenda.

1. Name the neuter article in Spanish. Example—Youth has not foresight of the future, experience of the past, nor moderation to conduct itself in the present.

2. What are the rules as to placing the adjectives before their nouns? Examples—The experienced pilot perceived (from afar) the towering summits of the mountains of Leucaba. The mild zephyrs, more powerful than the burning beams of the sun, preserved a grateful coolness.

3. When is the passive voice in English expressed in Spanish by prefixing the pronoun *se*? Examples—It has been said that the enemy will be surprised. The victory would have been gained by us, if our troops had not been twice repulsed.

PART III.

Candidates for the Third-class Certificate will have to translate half of the above extract from Gil Blas, to answer the grammatical questions, translating into Spanish their examples, and the following phrases:—

Let us have more indulgence. In order that I may have a benefice. The mother must have a mild temper. Are you right in telling such a history? I am wrong in speaking to you. Will your children be afraid at home? We are neither right nor wrong in hearing his reproaches. Let them all suffer the punishment, though only one may deserve it. Many shut their ears to the voice of conscience. They distribute their property among the poor. From that place they hear every thing easily. He died the following day. The groans attracted the attention of the hearers.

FREE-HAND DRAWING.

THREE HOURS ALLOWED.

Make a copy of the whole or part of one of the drawings which you have brought with you, so that the Examiner may judge whether the original work is your own doing. If you have not brought a drawing make a repetition from memory of any studies you have made during the last twelve months; the original drawings should be sent in afterwards.

DIRECTIONS FOR THE LOCAL BOARDS.

Notice should be given to the candidates for examination in free-hand drawing, that they should bring any studies which they have finished during the last twelve months, as proofs of their abilities.

NATIONAL PORTRAIT EXHIBITION IN 1866.

In accordance with the suggestions made in a letter from the Earl of Derby, published in the *Journal* in June last (p. 541), the Lords of the Committee of Council on Education have determined to hold a National Portrait Exhibition at South Kensington, in the arcades overlooking the Royal Horticultural Society's Gardens, which will be opened in April, 1866. A Committee of Advice has been constituted, consisting of the Trustees of the National Portrait Gallery and other noblemen and gentlemen, the Earl of Derby being president.

The following are the arrangements approved for the Exhibition:—

1. The Exhibition is specially designed to illustrate English history and the progress of art in England. It may be divided into two or three sections, representing distinct historic periods exhibited in successive years, depending upon the number of the portraits received and the space available for their proper exhibition.

2. It will comprise the portraits of persons of every class who have in any way attained eminence or distinction in England, from the date of the earliest authentic portraits to the present time; but will not include the portraits of living persons, or portraits of a miniature character.

3. In regard to art, the works of inferior painters representing distinguished persons will be admitted; while the acknowledged works of eminent artists will be received, though the portrait is unknown, or does not represent a distinguished person.

4. The portraits of foreigners who have attained eminence or distinction in England will also be included, with portraits by foreign artists which represent persons so distinguished.

5. The Exhibition will be held at South Kensington, in the spacious brick building used for the refreshment rooms of the International Exhibition in 1862; and these galleries, which are perfectly dry, will be fitted up expressly for the Exhibition, and patrolled day and night by the police.

6. All charges for the conveyance of pictures accepted for exhibition by the Committee will be defrayed by the Department of Science and Art.

7. The Exhibition will be opened early in April, 1866. The portraits, for the purpose of proper arranging and cataloguing, will be received not later than the second week in February, and will be returned at the end of August at the latest; but, although the Exhibition will continue open till that time, any owner who requires the return of his contributions at the end of July will have them forwarded to him at once.

8. In accordance with the usual practice, the Science and Art Department, unless the owner objects, will take photographs of such portraits as may be useful for instruction in the Schools of Art, and allow them to be sold in the Museum; but no permission will be granted to any private person to photograph, without the owner's express sanction. Two copies of each photograph taken will be presented to the owner of the picture photographed.

9. As was the case at the Exhibitions of 1861 and 1862 (and as is usual at the Royal Academy and other exhibitions), the department cannot be responsible for loss or damage, but every possible care will be taken of works

lent; and it may be added that the numerous paintings lent for exhibition in 1862 were collected and returned by the same agency as will be now employed, free from any injury or damage of any kind.

10. All correspondence marked on the cover "National Portrait Exhibition," should be addressed to the Secretary of the Science and Art Department, South Kensington Museum, London, W.

Mr. Samuel Redgrave, to whose valuable labours the successful formation of the collection of portrait miniatures is chiefly due, has undertaken the special charge of directing the Exhibition, and Mr. Sketchley will act as Secretary.

BRITISH ASSOCIATION, 1865.

On Chain-testing Machines. By Sir W. G. Armstrong, C.B.

The following paper was read before the Mechanical Section:—

The engineering firm of which I am a member, having been entrusted with the construction of the apparatus for testing chain cables and anchors, lately established at Birkenhead by the Mersey Harbour Trustees, had occasion to enter into a very careful consideration of the conditions requisite for effecting the operation in the best possible manner. As public attention has been forcibly directed of late to the importance of more accurate methods of testing chains and anchors, a few observations on the subject of the Birkenhead machine will not at the present moment be mistimed.

The most important consideration in the construction of a chain-testing machine is to obtain an accurate indication of the strain upon the chain. The hydraulic press has been for many years the appliance usually employed for exerting the strain, and nothing can be better fitted for the purpose; but the methods of determining the amount of the strain have been extremely imperfect. Most commonly the strain has been estimated by the indications of a mitred valve pressed down by a lever and weight. The impossibility, however, of restricting the tightening surface of the valve to a definite annular line, so as to exclude any variation of area, rendered this mode of indication highly delusive; so much so, indeed, that the attendants generally paid more regard to the indication afforded by the crackling of the scale on the surface of the iron than to the amount of load upon the valve. By substituting a loaded plunger for a loaded valve the uncertainty arising from variability of surface is obviated, but a plunger requires a packing to make it water-tight, and the effect of the friction of this packing has to be considered in relation to the friction of the press. A plunger without friction would give untrue indications of the strain, unless the press were also without friction; but friction cannot be avoided in the press, and therefore friction becomes a necessary element of accuracy in an indicating plunger. To make this more apparent it is only necessary to consider that in the press the friction of the packing lessens the tension exerted on the chain, while in the case of the indicator the friction of the packing lessens the weight necessary to indicate the pressure. If, therefore, these two frictions be in harmony, the load on the indicator will be diminished in the same proportion as the tension on the chain, and thus a direct indication of the strain upon the chain will be obtained.

The proper and usual packing for the hydraulic press is a cupped leather, but as the lip of the leather is pressed against the surface of the ram by the action of the water, the amount of its friction varies directly as the pressure. It is therefore necessary that the indicating plunger should also be packed with a cupped leather, in order that its friction may likewise vary directly as the pressure. But as the ratio of circumference to area is very much greater in the small ram of the indicator than in the large ram of the press, it is obvious that with similar leathers the relative friction would be widely different in the two cases. The friction may, however, be brought to a proper adjustment by reducing the breadth of the lip in the leather of the indicator until its friction is in unison with that of the press leather. This adjustment should be made when the press ram and the indicator plunger are both perfectly clean and free from any lubricating substance, and in no subsequent use of the machine should either oil or grease be applied to these parts. The effect of employing a lubricator is to diminish the friction in the first instance, but afterwards to increase it, because the unctuous character of the lubricant is soon exchanged for a stickiness which produces an opposite effect. In fact, when grease or oil are used the frictions become so irregular as to render impossible an accurate correspondence between the press and the indicator.

There is another desideratum in the testing of chains which requires a further elaboration of the indicating apparatus. When a chain breaks in the test it is desirable to show not only that it failed to bear the full test strain, but also what was the amount of strain exerted at the moment of fracture. In the case of the Birkenhead machine, various indicators, upon the principle of those commonly used for steam pressure, were tried for the purpose of effecting this latter object, but none of them gave satisfactory results. An apparatus was therefore designed for the object, which has since come into very general use, under the name of the "pendulum indicator." In this apparatus the pressure upon the indicating plunger is exhibited by the travel of a pendulum through a graduated arc. The movement is communicated from the plunger to the pendulum through the medium of a compound lever. When a chain breaks the pendulum falls back until stopped by a ratchet, but leaves a marker at the exact point on the scale attained by the pendulum at the moment of rupture.

I have hitherto spoken of friction only in reference to the packing of the apparatus. This friction, as I have already stated, varies with the pressure, but there is also the constant friction due to the weight of the moving parts to consider. If the machine be used exclusively for high strains in relation to its weight, this constant friction will be unimportant, but if a heavy machine be used for testing light chains, a considerable element of error will be introduced, unless a proportionate friction of the same constant character be added to the indicator. Still, however, it is better that very heavy machines should not be used for testing very light chains, unless they be constructed with more than one press, to act separately for light chains and conjointly for heavy chains. With this view, the Birkenhead machine has three presses, the centre one being used alone for light strains, and the three acting in concert when great strains are to be exerted.

Although an hydraulic indicator, properly constructed and correctly adjusted in regard to its friction, may be safely relied upon as indicating with sufficient precision the strain exercised by the machine; yet, for the purpose of ascertaining in the first instance when correct adjustment has been attained, and also for detecting any discrepancy which may subsequently arise from dirt upon the ram or plunger, or from any other cause producing irregular friction, it is necessary that every machine should be provided with a lever indicator, to which the strain may be immediately applied, and the strain ascertained by the lifting of a weight. Such an apparatus requires to be accurately fitted with knife-edge bearings, in order to afford delicate indications, but, as these are liable to deterioration by too frequent use, it is better to reserve the lever apparatus as a standard of reference for adjusting the hydraulic indicator, which is not liable to deterioration by use. It is not necessary that the lever indicator should range as high as the hydraulic indicator, for, if the two indicators register alike through a sufficient series of the lower strains, no discrepancy would be manifested if the comparison were carried to the highest powers of the machine.

I may here mention that nothing so soon deteriorates the lever apparatus as inadequate length of the knife-edges in relation to the strain upon them. The conclusion arrived at in the Elswick Works is, that not less than one-inch length of edge should be allowed to every five tons of strain upon the bearing.

In the arrangement of a public chain-testing establishment, it is desirable that the apparatus for the various operations should be placed in such succession as will allow the chains to move from process to process without any retrogression. The Birkenhead Chain-testing Establishment commences with a store room for the reception of unproved chains. From this store each chain is dragged by a steam-power capstan through an opening in the partition-wall on to the testing-bench of the machine. It is there made fast—at the one end to the press and at the other to the cross-head, supported on live rollers, which cross-head may either abut against a stop or be connected with the lever indicator. After the chain has been proved it is dragged by a second capstan directly forward in the same line into the examining-room, and there stretched upon one of the benches, where it undergoes a close inspection. If found perfect, it is then hauled forward by a third capstan through the heating oven and blocking trough, and is thence passed complete into the delivery store at the opposite end of the establishment. The course of the chain being thus in one straight line, it is necessary to carry it over the machinery at each end of the testing-bench, and to accomplish this a channel of wrought iron is fixed over the machinery to support the chain in its passage. Should the chain fail in the test, or be found defective on examination, it is drawn off by one of the capstans to the smiths' fires, placed on the floor of the examining-room, and after repair is again hauled to the testing-bench for a second proof. For the convenience of handling heavy chains at the smiths' fires a hydraulic crane is connected with each fire. Between the testing and examining rooms there is an intermediate room, called the Indicator-room, in which the lever and hydraulic indicators are placed, and the valves of the apparatus manipulated by an attendant in view of the indicators.

Anchors are received into the same store-room as the chains, and the usual appliances are provided for fixing them in the test. Over-head cranes are employed for lifting the anchors, as well as for lifting the chains in the two stores.

There are two testing machines in the establishment, fixed at opposite sides of the room. These are similarly arranged in every respect, but one of them is adapted to test up to a strain of 200 tons and the other to 300 tons.

The hydraulic pressure is supplied from a neighbouring accumulator, used for a system of hydraulic machinery, at work in the adjacent dock.

As the general practice is to make chain cable in lengths of fifteen fathoms, the Birkenhead machines are adapted for that length. The Board of Trade have recently fixed upon that length as the limit of length of chain to be tested at one time. The propriety of their so doing has been called in question, but I may state that it is the opinion of those persons who have the management of the Birkenhead machines, that no advantage of any kind would be gained by testing chains in greater lengths. If there is to be a limit, it is clear that such limit is best fixed at the length at which chains are usually made. There is, besides, a positive objection to exceeding that limit, because a greater length than fifteen fathoms cannot be tested without the use of intermediate supports, which, whether they be slides or rollers, are objectionable as being liable to produce variations of strain in different parts of the chain.

Another objection to permitting indefinite lengths of chain to be tested at one time arises out of the stretch to which chains are subject in testing. This stretch occasionally amounts to five feet in fifteen fathoms, and if that length of chain were greatly exceeded, it would involve a press of very inconvenient length, or necessitate taking repeated holds of the chain, which would be highly objectionable. I think, therefore, that the Board of Trade have acted wisely in imposing a limit, and in fixing that limit at fifteen fathoms.

ON A NEW METHOD OF MEASURING ELECTRICAL RESISTANCES, APPLIED BY MESSRS. SIEMENS.—BY ROBERT SABINE AND LOUIS SCHWENDLER.

The following was read in Section A:—

The insulation of submarine telegraph cables was, until the Red Sea and Indian lines were submerged, in 1859, determined qualitatively by the simple deflection of a galvanometer needle. If the deflection obtained, when the further end of the cable was in air, was very small in comparison with that obtained when the end was to earth, the cable was pronounced good; no deflection indicated a very good cable; and a great deflection an indifferent one.

A most decided step in advance of this crude method was made by Messrs. Siemens. It consisted in regarding the insulater as a bad conductor whose resistance could be expressed in the same measure as that of the copper line; and Mr. Fleeming Jenkin, about the same time, appears to have made experiments with the same end in view.

The manufacture of the core of the Malta-Alexandria cable, with the scrupulous surveillance of its electrical conditions, forms an era in cable work. Messrs. Siemens, who were entrusted by the Government with the duties of electricians, may be said to have then first established with success the science of cable-testing.

The system of tests applied to the single lengths of the core at the gutta-percha works gave their resistances of insulation and conductor, at a uniform temperature of 24°C., in the same units of measure.

As the whole of the cable was tested daily also at the Sheathing Works at Greenwich, as it grew in the tanks, from one to some hundreds of knots in length, it was necessary that the system of measurement should be equally exact, and applicable to long as to short lengths.

When the length of a cable is great, or its insulation indifferent, the value of the latter may be ascertained by the same method as that used in measuring the copper resistance — that of Wheatstone's bridge. But when the insulation exceeds a million units, this method becomes no longer available, on account of the differences between the currents in the four sides. It is therefore necessary to have recourse to a method less limited. For this purpose the deflection of a magnet-needle is observed, when the measuring battery, cable, and galvanometer are alone in the circuit; the constant of sensibility of the instrument being ascertained by the substitution of a unit of resistance and of electro-motive force for the cable and the measuring battery.

With a delicate galvanometer—such as Dubois' sine or Thompson's reflecting instrument—and a sufficient battery power, this method is available for measuring the highest resistances which have to be determined in cable-work. It is found, however, to be less adapted to the determination of resistances of a value lower than four or five millions of units; to be inconvenient on board ship during the submersion of a cable; and to be always burthened with a certain amount of tedious calculation. It was therefore necessary to seek for another method which would combine the simplicity and accuracy of Wheatstone's bridge with a higher range. The method determined upon was a modification of the common differential galvanometer. The equality of the coils was abandoned, and the relation of their magnetic forces upon the needle system only ascertained as a constant of sensibility.

As early as 1860, one of us used, in cable measurements, at Greenwich, a differential galvanometer with two coils, one of which exerted two thousand times more deflective force upon the needle than the other. The cable and the measuring battery were inserted in the circuit of the larger helix and a single element, with a set of resistance-coils in that of the less sensitive helix of the instrument. The resistance in the latter circuit was altered until the magnetic forces of the two currents upon the needle were equal and opposite, and the pointer rested over the zero line of the card. The manipulation was simple, and the necessary calculations reduced to the mere multiplication of the value of the resistance inserted in the smaller circuit with the constant of sensibility and the relation of the electro-motive forces.

This method was found to answer well, being quite as delicate as the bridge, as unlimited as the method of deflection, and, at the same time, having the advantage of being totally independent of the magnetism of the needles. It has, therefore, been used very generally by us in cable and other measurements since that time.

On the occasion of fitting out the Carthagena cable expedition, it was considered desirable, in measurements of insulation on board ship, to dispense entirely with mathematical reductions, and to read off the resistances directly from the instrument.

It is easily understood that, to establish an equilibrium between the magnetic forces of the currents in the coils, it is not absolutely necessary to alter either of the currents; the same may be done equally well by altering the relative distances of the coils from the needle. This is the principle on which the new method forming the subject of this communication is based. The mechanical construction of the instrument is very simple; the magnetic needle system is suspended by a fibre of unspun silk between about 10,000 turns of a long, thin, well-insulated copper wire; its position being indicated by an aluminium pointer fixed across the same axis, moving over a dial-card, and observed through a magnifying glass.

Outside the case of the instrument is a horizontal metal stage, on which a vertical coil of copper wire is moved to and from the needle by means of a micrometer screw. This is the coil whose distance from the needle is varied, in order to make its deflecting power equal, at any moment, to that of the stationary coil. Its distance is observed with the aid of a scale engraved on the side of the metal stage which it travels over. The whole instrument stands upon a tripod with three adjusting screws. Its remaining mechanical arrangements differ slightly, in some points, from those of other instruments—greater facilities being given to the operator for centering the needle system and for levelling the instrument.

We will now give a sketch of the theory of the method and of its use in cable-testing.

Suppose two galvanic currents circulate in the two coils—the stationary and the moveable one—in opposite directions; they will oppose each other in their effects upon the needle, which will take up a position at an angle less than that which it would if the stronger coil were alone active. By altering the position of one of the coils a point is reached where the deflective force of one coil is made to exactly counterbalance the force of the other, or the needle returns to zero.

We will call the magnetic force of the stationary coil, with a unit of current upon the needle, m; that of the movement coil, with an equal current, $-n$. Further, when the balance is established by unequal currents, let these currents be, s, in the stationary, and s' in the moveable coil.

Then the magnetic force of the current in the stationary coil will be

$$ms,$$

and that in the moveable coil

$$-ns',$$

which, together, neutralise each other, or the sum

$$ms - ns' = 0.$$

The relation $\frac{m}{n}$ of the magnetic force of the coil is

$$\frac{m}{n} = \frac{s'}{s} = a$$

a being a constant of sensibility of the instrument for only one certain position of the moveable coil. The greater the distance of the latter from the needle system, the greater becomes the value of a; because n is variable with the position of the moveable coil, decreasing, according to the theory of magnetic forces, as some function of the distances of the coil from the needle increases. Therefore, the value of a for any given distance, d, of the coil from the needle would be

$$a = m\,F(d)$$

As the function, F, however, is a very complicated one, where the distances are not very great in comparison with the lengths of coil and needle, it is necessary, in practice, to ascertain experimentally the value of a for every division of the scale.

Being thus in possession of the constant of sensibility for every position of the moveable coil, let us imagine next two separate circuits; one includes the stationary coil, a battery whose electro-motive force is E, and the resistance, x, of the cable insulator; the other circuit includes the moveable coil and an element where electromotive force is e.

We have, then, in the cable circuit, the current, S,

$$S = \frac{E}{x + r} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

in which r is the resistance of the battery and instrument.

In the moveable coil the current is s'

$$s' = \frac{e}{r'} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (2)$$

r' being the instrument and battery resistance in this circuit.

The currents in the two coils, tending to deflect the needle system in opposite directions, if the distance of the moveable bobbin be altered sufficiently, the needle may be brought to zero, and we have the equation

$$\frac{s'}{S} = a \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3)$$

From (1), (2), and (3), the constant a is

$$a = \frac{e}{E} \cdot \frac{x + r}{r'}$$

and the resistance, x, of the cable insulator,

$$x = a \cdot \frac{E}{e} \cdot r' - r$$

Usually, r is very small in comparison with x; it may, without appreciable error, be neglected, and the resistance of the cable be expressed by,

$$x = a\,\frac{E}{e}\,r'$$

With the aid of this formula a table is constructed, $\frac{E}{e}$ and r' being constant quantities, and the value of a known for every division of the engraved scale.

To measure the resistance of a cable with this instrument, therefore, nothing more is necessary than to put it in circuit with the larger coil and its battery, E, and to vary the distance of the moveable coil until equilibrium is obtained. The distance is read off, and the table supplies the corresponding resistance in units.

VOLUNTEER FIRE BRIGADE.

The New York correspondent of the *Standard* gives the following:—Of late the city has been disgraced by firemen's fights, one or two of which have been of a decidedly sanguinary character—one, indeed, rising to the proportion of a riot, and requiring in its suppression the charges and batons of some 300 policemen. Until within the last few weeks the checking of fires in the metropolis has depended entirely upon the efforts of volunteers, organised after a fashion, having their distinctive company names, and governed by a marshal elected by themselves. The five departments under this system became at last a gigantic political " machine;" its members were simply red-shirted ruffians (generally speaking), exercising complete terrorism at the polls in many of the election districts, and oftentimes completely bidding defiance to law and order. Their riots in the streets and at their " engine-houses," their robberies on the highway, and their general Thuggism, in time more than counterbalanced the undoubted gallantry and heroism they displayed at the numerous conflagrations with which our city has been visited, so that a paid fire department becomes absolutely necessary. The law authorising such an organisation was passed by the last legislature, and, after many ups and downs, the new force has been placed in action. The system just inaugurated has met with the open or covert opposition of hundreds of the volunteers, the worst class excited to such hostility by the ward and grog shop politicians, who saw that a paid department would put an end to their hopes of office. The rivalry existing between the various companies, always productive of evil, sprang at once into the shape of open battles. Thus, on the morning of Sunday, the 20th of August, a riot occurred in the Thirteenth Ward in this city, which at one time bade fair to equal the most sanguinary battles in our municipal history. The members of Engine Companies Six and Forty-one met by preconcert, and fell upon each other with great fury. Each fireman was armed with pistol or loaded club, or with both; and each company " blazed away " with revolvers at the other until the ammunition gave out, and then came to close quarters. Happily, under the circumstances, the belligerents were very poor marksmen, for but one man was killed outright, and two mortally wounded. The police of three precincts gathered and charged upon the combatants, and finally put them to flight. Both companies have been disbanded. As is usual in such cases, all the victims of the riot were spectators, none of the active participants being dangerously injured. On Friday evening last another battle, not so sanguinary, but for a time quite as determined, took place, the belligerents being members of Engine Companies Forty-six and Twenty-one. These street fights, fearful as they are, are not, however, the most significant proof of the utterly lawless character of our volunteer firemen. Their hostility to the new system is most startingly betrayed in the extraordinary increase in incendiary fires noticed within the first six months of the year. During the half-year ending in June there were 82 fires of incendiary origin; and there were, in addition, 18 attempts at incendiarism. There were during this time 39 arrests on charges of arson, or attempts to commit that crime. Two of the persons arrested were convicted and sent to the state prison; seventeen were discharged by the grand jury or by police magistrates; six were indicted, and are now awaiting their trial; four were held to bail; two were discharged on their own recognisances; one was held as a witness; and seven stand committed pending an examination. By these known incendiary fires two persons have lost their lives. The people pray most devoutly for the complete establishment of the paid system, as, indeed, they have reason to do. But the malcontents of the old department mean to make all the mischief they can before they are driven out; and it is highly probable that the police will have heavy work to do before the last vestiges of the volunteer system are destroyed. It is a well known fact—and a powerful argument in favour of a paid system, adduced by the police commissioners in their examination by the legislative committee last winter—that in the great riot of 1863 many of the firemen bore an active part, in some instances whole companies going over to the mob, and acting the *role* of incendiaries. I doubt if in any other city save job-ridden New York it would have been possible for such a monster organisation of outlaws and desperadoes to exist, under sanction and protection of the law, and enjoying peculiar privileges and immunities.

Fine Arts.

Paris Exhibition of Industrial Art.—This exhibition, which has already been mentioned in the *Journal*, has grown, by subsequent additions, to great importance, and it may now be said, without hesitation, to form the finest collection of industrial art, retrospective, contemporary, and prospective, that Paris has yet witnessed. As regards the retrospective portion, the arrival of new contributions can scarcely yet be said to have ceased. Nearly the whole of the building, with the exception of that occupied by the permanent Algerian and colonial collections of the Government, is now filled with the treasures of past ages, the products of the present time, the works of industrial designers, and the studies of the pupils of the public schools. The ceramic arts occupy a large proportion of the space allotted to the past, and the collection is not only exceedingly extensive but also very choice. In the first place, the Union Centrale exhibits its own collection of Chinese, Japanese, Indian, Persian, and European porcelain and *faïences*, including many rare specimens, with labels, bearing the date and place of production, with other particulars, useful to students and connoisseurs; there is a large collection of Saxon ware of the seventeenth century, and of old Sèvres china, including a complete set, which belonged to the naturalist Buffon, and which is decorated with the birds that figured in his works, and a large number of pieces forming part of the two fine sets belonging to Madame du Barry. The collection of the works of Bernard Palissy and of the old potters of Rouen, Marseilles, and other places, of Italian ware of the sixteenth century, of decorated, gilded, and prismatic ware of all countries and ages, with a few examples of the art of Flaxman, and the ingenuity of Wedgwood, is perhaps the most extraordinary ever brought together under one roof; the specimens of large pieces of Rouen ware of the early, as well as of the grand epoch, and that of the decline of the art, could scarcely be surpassed; and the glass cases, containing the contributions of MM. Rothschild, Baron Schwiter, Salin, and other well-known collectors, abound in dishes and other pieces of ware, intended for the ordinary purposes of life, which are now preserved in frames, and equal in market value to the pictures of the great masters. The collection of enamels of Italian and French origin, in the sober grisaille of Limoges, or glowing in all the colours of the rainbow, representing subjects historical, religious, artistic, or merely fanciful, is equal in importance, if not in amount, to that of the ceramic wares, and a comparison of the best specimens of these with the works of French artists of the present day shows, in spite of the taste and ability exhibited in the latter, how far the art-workmen of the present day are, in matters of this kind, behind those of past ages. The specimens of ancient glass from the earliest rude productions to the pure forms of a later period, the beautiful prismatic effects and curious twisted and complicated decorations of a still later epoch, are numerous and in some cases unique. There are some fine specimens of metal work in the exhibition, from the rude locks of the earliest time, to the elaborate hammered, pierced, chased, and engraved work of the sixteenth century, when the material seems to have made little difference as regards the amount of art bestowed by the workman, and when a morsel of iron was converted almost into a jewel by the cunning hand of the artist; the smith, locksmith, cutler, and armourer, vied with the gold-smith and the jeweller, and all left behind them the impress of the artistic period in which they lived and laboured. The arms and armour in the exhibition are of superlative excellence, and this is not surprising when it is known that the Emperor, and many of the most noted amateurs, have contributed their choicest specimens. The Imperial collection alone includes more than five hundred articles. There are more than twenty complete sets of armour, illustrating various periods of Italian, German, Saxon, and other art, and including some very curious examples of the tilting armour used in Germany, with all its grotesque complications. The great value of the collection lies in the ornamentation, and the number and beauty of the decorated specimens are remarkable—cuirasses, helmets, shields, swords, daggers, halberds, battle-axes, maces, spurs, powder-flasks—exhibiting every variety of ornament, hammered, chased, engraved, pierced, inlaid, niello, and gilt-work of the various periods of Oriental, Italian, German, and French art, and so exhibited that every detail may be seen without an effort. The collection includes a vast number of fine bronze figures and ornaments, Greek, Roman, Gallo-Roman, French, Italian and German; series of gold coins of remarkable beauty, illustrative of ancient and modern engraving; curious old German silver ware of the seventeenth century; many of the choicest specimens of the enamels of Petitot and other artists on snuff-boxes, comfit-boxes, and other articles of the kind; beautiful examples of carved work, in ivory and wood, of all countries and periods; cabinets and articles of furniture, carved, inlaid, and decorated in every possible style, from the church and other furniture of the middle ages down to the rococo productions of the eighteenth century; tapestry, brocades, embroidery, lace, and other work of every country in the world, Asiatic as well as European. In fact, there is scarcely a single industrial art of any period, or of any country, which is not fairly represented in this remarkable exhibition. It is unfortunate that circumstances have not permitted the management to publish a catalogue of the whole collection, but the late arrival of many of the contributions evidently rendered this impossible to the present moment. Catalogues have appeared of the modern portion of the collection, and of the Imperial collection of arms, and others are promised shortly. The Exhibition is announced to remain open until the end of November.

Exhibition of Works of Art in Venice.—The Venetian Society for the Promotion of the Fine Arts announces the organisation of a permanent exhibition of works of art under its auspices. Foreign artists are admitted as exhibitors, but must bear the whole charge of transporting their works to and from Venice. They are to be addressed to the Presidenza della Società Veneta Promotrice di Belle Arti, Palazzo Mocenigo a S. Benedetto, Anagrafico, No. 3,980. Each series of contributions will remain on view for two months.

Exhibition at Versailles.—The Annual Exhibition of the Society of the Friends of the Arts of the Seine-et-Oise, was to open on the 8th instant.

Scandinavian Exhibition.—The difficulty which occurred in consequence of the determination of Sweden and Denmark to hold exhibitions of Scandinavian industry in their respective capitals at the same period, has been met by the abandonment of the project, for the present, on the part of the authorities of the latter country. The Stockholm exhibition, therefore, now stands alone, and is fixed to open, as announced in the *Journal* some weeks since, on the 15th of June, 1866.

Art Convention between France and Nassau.—The *Moniteur* announces the promulgation of a convention recently agreed to between France and the Duchy of Nassau for the reciprocal protection of property of works of art of literature.

Public Statues.—A double *fête* occurred the other day at Montbard, in the department of the Côte d'Or, when the supply of water to the town was inaugurated, and a statue of Buffon, the naturalist, erected some time since in the same town, was consecrated; the engineer of the water works is a grand-nephew of the *savant*, and both were born in the town where the ashes of the former repose. Discourses were delivered by the celebrated chemist, M. Chevreuil, director of the museums in the Jardins des Plantes; M. Decaise, president of the Academy of Sciences; M. Duméril, representative of the Imperial Acclimatization Society; and by the Maire of Montbard. Brussels has just erected and inaugurated a monument in honour of M. Verhaegen, the founder of the Free University in that city. M. Verhaegen died in 1862, having founded the Free University in 1834, and leaving, by will, to the municipality of Brussels the sum of forty thousand francs, for the encouragement of education.

Art Education in France.—Although architecture has so many professors and students in France, and although so much attention has been given of late to domestic architecture in particular, there has not existed a preparatory school for instruction in the practical parts of the art. The Academy and the New School of Fine Arts include architecture in their classes, and it holds a very eminent position in the course of studies, but the want of practical instruction has long been felt, and it is now being supplied. A central school of architecture has been set on foot, with the countenance of the government, under the patronage and with the subscriptions of the Prince Napoleon; M. Boitelle, Prefect of Police; MM. Michel Chevalier, Emile Péreire, E. Fould, Caffarelli, Viollet le Duc, Flachat, and other gentlemen. The school will be under the direction of M. Emile Trelat, Professor at the Conservatoire des Arts et Metiers, aided by MM. Tresca, Burat, Muller, de Mastang, and other professors. The studies will embrace all the elements of the art and science of architecture, and the course will occupy three years, when the pupils, it is hoped, will be better prepared than they are at present for availing themselves of the advantages of the School of Fine Arts, and more independent of the teaching of the workshop as regards knowledge of the materials employed in their profession and methods of construction.

Manufactures.

The Silk-worm.—The following account is taken from the report of Mr. Meadows, H.B.M. Consul at the port of Newchwang:—

"In a journey to the Corean borders during the autumn of 1863, I found myself, so soon as I had crossed the watershed of the Leaou mountains, travelling through a silk-producing country. I had, indeed, heard before of silk being produced at and near Fung-hwang city, but had considered it merely an amateur domestic occupation, not capable of being developed into a trade. That it is much more than this, and that it may furnish in time what the port greatly wants, an article of export to Europe, I have now no doubt. Questions have been raised as to the nature and characteristics of the silk-worm peculiar to this district, but only a personal visit to the silk-producing country for the express purpose of getting information could enable me to give answers to them on which I myself could place full reliance. It is difficult enough to extract good information from Chinese when in the midst of the things inquired of; at a distance it is next to impossible. As an instance of this, I may state that in spite of all my frequent inquiries, made both when in the silk-producing district and at this port from natives of that district, it is only within the last few months that I have learnt of another tree besides the oak on which the large worm feeds. The oak-bush is called locally *Po lih ko tsi*. The other bush is called *Chien tso tsi*. Its leaves are narrow and long, as compared with those of the oak-bush. Its bark is of a greenish white hue, and is smooth, and its trunk and branches straight and ungnarled as compared with those of the oak. It produces a seed or fruit on which pigs feed. It must, I think, be a species of beech. The silk produced by worms fed exclusively on this bush are said to be stronger than when they are fed on the oak. It is, I fear, beyond doubt that the oak-leaf-eating worm, the *shan keen* or mountain worm, as the Chinese here call it, is of a different species from the mulberry-leaf-eater, which is here called the *kea keen* or domestic worm; and that, therefore, the hope of a beneficial crossing cannot be indulged in. On the other hand, the mulberry-leaf-eater or domestic worm of the Newcwhang consular district does seem to be of the same species as that of middle China; and it might be desirable to try the effects of a crossing with an animal that has probably for many generations been a separate inhabitant of this widely different climate. As the cocoon produced by the mountain worm is about three times the size of that produced by the domestic worm, so the worm itself is about thrice the thickness, though little if anything longer. It is of a brown or dry-earth colour, and has on its back little knobs or protuberances. In its flying stage the 'mountain' insect is a large and richly-coloured butterfly, measuring from tip to tip of its expanded wings some seven to nine inches, 'as large as a swallow.' A native of the silk country now here professes to have once fed a few mountain worms on mulberry leaves. They ate as much as five or six times the number of domestic worms, and the cocoons they spun did not at all differ in their appearance from those spun by mountain worms fed on oak-bushes. The same man tells me that the stuff made from the cocoon of the mountain worm will take only a black or a purple dye, and that those who desire to make with it a stuff of other colour are obliged to use some proportion of cotton threads. Looking to the three great classes of textiles, cotton, wool, and silk, the produce of the mountain worm must be classed with the latter, inasmuch as it neither grows on a shrub nor on an animal's back, but is produced by a leaf-eating worm, and, viewed as 'silk,' it is manifestly of an inferior quality. But if we choose to look at it simply as a new textile, there is some reason to believe that it may prove to have useful qualities not possessed by either silk, wool, or cotton. Should it be found to possess some such peculiar quality so useful as to make it specially marketable, then it will become a matter of interest to ascertain whether a cocoon-forming worm which exists in a wild state in British North America—near the Canadian lakes, I think—is not the same animal as the Newchwang 'mountain' worm. The climate of the two regions is essentially the same, and if the cultivation should seem desirable in Canada, the difficulty of want of experience as well as want of sufficient labourers might be got over by introducing Chinese emigrants from the Newchwang silk-districts. Be that as it may, the produce of the mountain worm spun into thread or as cocoons should, if the provincial authorities are not allowed to interpose barriers to foreign adventure, prove a fairly remunerative export from this port town, and that for the reason stated in the accompanying memorandum; it has for generations back paid Chinese dealers to send it seaward in junks.

Accidents from Steam Machinery.—In consequence of the removal of certain restrictions respecting the employment of steam power in manufacture, the *Moniteur* has collected and published an account of the accidents which happened through the use of steam during the past year. It appears that the accidents were only sixteen in number, but that the number of persons who were killed, or died afterwards of the injuries inflicted, amounted to forty, and that fifteen other persons were wounded more or less seriously. Of the sixteen accidents, four occurred in sugar works, three in paper manufactories, two each in distillery and drug works, and one each in other industries. The causes of accident are classified as follows:—Eight occurred by the explosion of cylindrical boilers; three by that of tubular boilers with interior furnaces; one by the explosion of a locomotive; and four by that of steam-heating apparatus. The immediate causes are supposed in eight cases to have been the bad quality of the metal employed or the vicious arrangement of the furnaces; in seven others, carelessness or want of superintendence on the part of engineers or stokers; and in the remaining case from the imprudence of other persons. The *Moniteur* gives the details in each case, in order that manufacturers may take warning for the future. This return of course does not include railway or other accidents which occurred in connection with, but were not immediately caused by, steam machinery.

Commerce.

Hops in France.—It appears from official returns that the cultivation of hops in France has increased considerably of late years. The hops planted in the department of the Bas Rhin in 1857 covered a superficies of 574 hectares (2½ acres each), and there have been 120 additional hectares planted within the last eight years. M. Heuzé, in a communication to the Imperial Agricultural Society, attributes this increase in the culture of hops to the improvement in agriculture. It must be observed, at the same time, that the quantity of hops imported is increasing every year. In 1845 there were only 721,000 kilogrammes imported, while in 1855 there were 1,556,000 kilogrammes. The landowners in the Bas Rhin are at present making every exertion to supply a sufficient quantity for home consumption, and to enable the country to be independent of foreigners for a supply. It is said that French brewers, for a great number of years, were accustomed to make beer without hops. They substituted for the hop plant coriander seed, wormwood, and the bark of box-wood, but the bad quality of the beer thus produced disgusted their customers, and they compelled brewers to use hops, as the only substance which can produce a wholesome beverage. It is stated that every inhabitant in France consumed, on an average, in the year 1825, nine quarts of beer. The consumption increased in the year 1837 to nearly twenty litres, and since then it has progressively increased.

The Tobacco Trade at New Orleans.—In 1863-4 the supplies of tobacco here were too trifling to establish a regular market, and there has been but little improvement since. The stock has varied from 594 hogsheads in September, 1864, to 1,031 in December last, and 873 recently. In comparing the year's business with 1863-4, it appears that the total supply has consisted of 3,004 hogsheads, embracing 594 hogsheads on hand at the commencement of the year and 2,410 received since, against a supply of 1,638 hogsheads last year. The exports have comprised 1,831 hogsheads against 797. The reported sales have been confined to 300 hogsheads against 514. Prices have exhibited a wide range.

Colonies.

Labour in the Victoria Gold Fields.—Since the commencement of the present year, the number of miners has gradually increased. In 1862, an average number of 97,942 miners was employed, producing an aggregate of 1,702,460 ounces of gold, equal to an average of £1 9s. 6d. weekly for each miner. In 1863, the miners numbered 92,292, producing 1,578,079 ounces, making the average weekly earnings £1 6s. 3d. each. In 1864, there were 83,394 miners, and the produce 1,557,397 ounces, equal to £1 8s. 9d. as the average earnings of each miner weekly. From January to the end of June, 1865, the number of miners was 85,022, who produced 656,436 ounces, making an average of £1 7s. 4d. each per week. In the first six months of last year, the numbers were 83,175 miners, resulting in 759,461 ounces of gold, or an average of £1 8s. 1d. per week for each miner.

The Vintage in Victoria.—The Victorian vintage is year by year becoming of more importance to the colony. There are flourishing and increasing settlements in the neighbourhood of Geelong, Castlemaine, and Sandhurst, as well as about Melbourne, devoted to the cultivation of the vine. Recently published statistics show that the total number of vines in the colony is now 8,150,000, of which 1,125,000 were planted in the preceding 12 months. The yield of wine from the vintage of 1865 will be short in quantity—in proportion to the increased area planted—but superior in quality. The deficiency is mainly attributable to the cold southerly gales and hailstorms that prevailed during the flowering season, by which every vineyard suffered severely. From the Yering and Tabilk districts the returns are most satisfactory; at the former, where 30 acres of vines are now in bearing, about 16,000 gallons of wine have been obtained, and at the latter place, where 150 acres are coming into bearing, the yield has been about 22,000 gallons. It is estimated that the total yield of the colony will not fall short of that of last year, which was 105,000 gallons of wine.

Agricultural and Pastoral Land in Victoria.—A return lately presented to the Legislative Council shows that in the year ending 31st March, 1864, the extent of land occupied by the squatters amounted to 31,683,366, or considerably more than half the area of the colony, whilst the average occupied by farmers was only 2,697,981—an insignificant extent when compared with the area devoted to pastoral purposes. The number of persons employed in agricultural pursuits at the time of the last census was 41,218, of whom 6,480 were females, whilst the persons engaged in pastoral pursuits were only 9,724, of whom 644 were females. The same return shows that in 1863 4 the value of the pastoral produce was estimated at £3,316.793, whilst the value of the agricultural produce was estimated at £3,676,250.

Progress in Victoria.—A permanent Fine Art Gallery has been formed in Melbourne, and the promoters propose to keep the place open constantly for the exhibition (expressly for sale) of pictures by colonial artists. Government are about to expend £3,500 in the erection of a post-office, savings-bank, telegraph-office, and Mechanics' Institute for the Collingwood district. The Building Society movement is in great favour in this colony just now. Several new associations have been established lately, and with every prospect of success. An Acclimatisation Society has been formed in Gippsland, as a branch of the present Society in Melbourne.

Obituary.

Francois Joseph Heim, French historical painter, and member of the Academy of Fine Arts for nearly forty years. He was born at Belfort, in the year 1787, took the great prize of the Academy when twenty years of age, and obtained one of the grand medals of honour at the Universal Exhibition in Paris in 1855. He is represented in the Luxembourg gallery by a picture of the "Massacre of the Jews;" at the Louvre by two ceilings; and he executed several large works in Notre Dame and other churches of Paris. He produced a large number of works exhibiting great knowledge and power of composition, and a fine eye for colour; but he will be best remembered by his drawings, which are full of vigour and originality.

Admiral W. H. Smyth.—On Saturday, the 9th September, at his residence, St. John's Lodge, near Aylesbury, passed away from us one whose name will ever be held in high honour in the annals of British science, and whose loss will be deeply felt by a large circle of attached and admiring friends. Although for several years past living in comparative retirement, yet devoted without ceasing, to within a few days of his death, to literary and scientific labours, Admiral William Smyth was at one time an active and prominent member of the scientific life of the metropolis. As president of the Astronomical Society, founder, and subsequently president, of the Geographical Society, vice-president, foreign secretary, and for many years member of the council of the Royal Society, director of the society of Antiquaries, visitor of Greenwich Observatory, one of the founders of the United Service Institution, in these and many similar capacities his untiring energy, extensive and varied acquirements, sterling integrity and honour, and his genial, social qualities exercised a great influence for good through the important circle in which he moved. He was born at Westminster, on the 21st of January, 1788, entered the navy at an early age, and served with considerable distinction in nearly all parts of the world, during the war which terminated in 1815. With a strong natural inclination for scientific pursuits, and an aptitude for work rarely equalled, he employed the following ten years in making those surveys of the less known parts of the bed and coasts of the Mediterranean which will ever associate his name with the history of that sea. Retiring in 1825 from marine life, he entered upon another phase in his scientific career, and commenced in his observatory at Bedford that laborious and accurate series of astronomical observations which resulted in the publication of the "Cycle of Celestial Objects," including the "Bedford Catalogue," a work universally acknowledged as one of the best handbooks of practical astronomy extant. Besides hydrography and astronomy, the admiral was an ardent cultivator of some branches of archæology, more especially numismatics; but a list of some of the more important of his numerous works will best give an idea of the extent and variety of his researches—"A Descriptive Memoir of the Island of Sicily," 1824; "Sketch of the Present State of the Island of Sardinia," 1828; "Descriptive Catalogue of a Cabinet of Roman Imperial large Brass Medals," 1834; "A Cycle of Celestial Objects," 2 vols., 1844; "Ædes Hartwellianæ, or Notices of the Manor and Mansion of Hartwell," 1851; "The Meditterranean, a Memoir, Physical, Historical, and Nautical," 1854; "Descriptive Catalogue of a Cabinet of Roman Family Coins," 1856; "Speculum Hartwellianum," 1860; "Addenda to the Ædes Hartwellianæ," 1864; "Sidereal Chromatics," 1864. Admiral Smyth married at Messina, in 1815, the only daughter of Mr. T. Warrington, of Naples, a lady of great accomplishments, and who has been the constant and devoted companion of all his scientific labours.

Publications Issued.

Electrical Communication in Railway Trains. By Andrew G. Brae. (*Effingham Wilson*, Royal Exchange).—The writer takes into consideration the causes which have hitherto prevented the successful application of this principle, reviews various attempts made, gives a list of several patents which have been taken out for the purpose, and then describes an invention of his own for effecting the object.

A Dictionary of Chemistry. Edited by Henry A. Watts, B.A., F.C.S. (*Longman and Co.*, London).—Part XXXI. of this work is just published, containing articles on Phenol and Phenymalines.

Popular Science Review. Edited by Henry Lawson, M.D. (*Robert Hardwicke*).—The October number of this periodical, which is a quarterly miscellany of entertaining and instructive articles on scientific subjects, completes the 4th volume, which contains the following articles:—Atlantic Telegraphy, by Robert Hunt, F.R.S.; On Pure Water, by Edwin Lankester, M.D., F.R.S.; On the Nature and Diagnostic Value of Raphides and other Plant-Crystals, by George Gulliver, F.R.C.S., F.R.S., &c.; On Lake Basins, by Professor D. T. Ansted, M.A., F.R.S.; Epidemics, Past and Present—Their Origin and Distribution; On the Microscopic Anatomy of an Insect Larva—Corethra Plumicornis, by E. Ray Lankester; The Moon, by James Breen, F.R.A.S.; Photography and some of its Applications, by the Editor.

Notes.

Cheap Railway Trips in France.—Visitors to Paris this year have the opportunity of visiting other parts of France at very moderate rates. An excursion to Strasbourg, enabling visitors to pass three days in that interesting town, took place the other day, the charge being 25fr. by the second, and 20fr. by the third class carriages, there and back. Another excursion train carries visitors to Havre and back for 12fr. and 9fr. respectively.

Cotton and Linen Tissues.—The *Builder* states that Professor Boettger has discovered the means, by the aid of chemistry, of recognising the presence of cotton in linen fabrics. He takes a piece of the suspected cloth, about two inches by three-quarters of an inch, and, after having unravelled both weft and warp, plunges it in an alcoholic solution of aniline and fuchsine. The superfluous colouring matter is removed by washing the piece of cloth thus dyed several times in water. If, while it is still wet, it be placed in a saucer containing ammonia, the cotton fibres will immediately become discoloured, while those of linen will preserve a fine red colour.

Cholera Precautions.—The head physician of the Paris and Strasbourg Railway Company has posted special instructions in all the stations on that line as to the precautious to be adopted in cases of an attack of diarrhœa. The company has, moreover, distributed among their *employés* boxes containing the medicine required at the first appearance of cholera, so that travellers and *employés* may find such remedies close at hand as are frequently sufficient to arrest the progress of the disease.

Special Education in France.—The establishment of a normal school of technical instruction, projected by M. Duruy, the Minister of Public Instruction in France, and mentioned in the *Journal* of the 8th of September, has been decreed, and the necessary steps taken to carry the plan into effect. In his report to the Emperor, the minister says that it is not enough that the manufacturers of France are supplied by the Ecole Polytechnique and the Ecole Centrale des Arts et Manufactures with managers and artizans of ability; they require also a good supply of foremen, whose hands have been exercised by practice, and whose intellects are also in some measure cultivated by study. To supply this want is the object of the new institution. It is necessary, says M. Duruy, in order not to interfere with the manual portion of the artizans' education, that the system of technical instruction should be so flexible that it may be bent to fit the various circumstances of the locality and the wants of the population, whether agricultural or manufacturing. Any uniform programme would therefore be unfit for the purposes in view, and it has been determined to appoint a special council, whose duty it will be to introduce such improvements into the system of each great special school as they may deem necessary, in order to maintain a due proportion between the scholastic duties of the pupils and the other elements of their training, or, in other words, to take care that the student does not obliterate the apprentice. These councils will be under a superior council of improvement, which will, moreover, be entrusted with the surveillance of the new Normal School of Cluny. This superior council will take cognizance of all documents likely to affect the subject, whether furnished by professors of schools, inspectors, or by those entrusted with missions abroad, and will decide on the measures to be proposed for adoption, by the minister, to the Emperor or the Imperial Council of Public Instruction. The Minister of Public Instruction is appointed president of this new council, and M. Dumas, of the *Institut*, vice-president. As regards the new establishment at Cluny, the minister has visited the old abbey in which it is to be placed, and finding that the buildings are sufficiently extensive to accommodate two establishments, it has been determined to create a special college side by side with the special normal school, in order that the pupil teachers may have the opportunity of immediately putting into practice the lessons which they have received from the professors of the superior establishment. The Abbey of Cluny will therefore be at once a normal and common school for the theory and practice of special instruction.

New Method of Fertilizing Soil.—Two gentlemen, members of the Agricultural Academy attached to the University of Bonn, M. Nouenbruck and Dr. Hardstein, have conceived a new method of assisting the formation of humus, and which, it is said, has been put into successful practice at Annaberg, near Bonn. The method is the introduction of air beneath the surface of the soil; a system of pipes, like those used for drainage, but pierced full of small holes, are laid at depths of from three to six feet beneath the surface of the ground, is placed in connection with a furnace, which keeps up a continual draft through the pipes, and thus the subsoil becomes so impregnated with air, that when the connection with the atmosphere is closed, the fire continues to burn in consequence of the superabundant oxygen which is conveyed to it by the pipes.

Correspondence.

Suburban Railway Traffic.—Sir,—The tardiness of our suburban railways is fast becoming a public grievance, one great cause of it being the time consumed in taking up and setting down passengers at the frequent stations; if a more expeditious mode of doing this could be discovered, railways near the metropolis might yet fulfil the hopes that have been formed of them. I believe I have discovered this "more expeditious mode," which I will describe as briefly as possible. I may premise that specially-constructed carriages would be required, and the addition of sidings to the stations which have not got them already; but this is merely a financial question. The plan is to have a passage through all the carriages, so that the train would communicate from end to end, and at the rear to have a setting-down carriage, so that the passengers who may wish to get out at any particular station have only to seat themselves in the last carriage, which the guard uncouples, and stops by application of break power. Thus far my plan is simple enough, and not by any means original. The real difficulty, however, is the taking up passengers when the train is on the move, and this I propose should be done as follows:—A carriage similar to the one cast off by the train should be in waiting in a siding, with the passengers in it, and this carriage the passing train would hitch on and draw after itself. Here, however, are two practical difficulties; one is to make the passing train catch up the end of the rope belonging to the waiting carriage,—but this problem any mechanic would readily solve, so, instead of taking up space to describe my own contrivance, I will pass to the next difficulty, which is to get rid of, or diminish, the shock of starting to the passengers in the carriage. Of course, if this cannot be done, the whole plan falls to the ground; but I think it can be effected in this way: The rope by which the carriage is drawn to the train should be wound round a drum containing a strong spring, so by this means the strain would be gradually applied. The strength of the spring would have to be proportioned to the force requisite to move the carriage—I suppose about double—so that when the rope would be half drawn out the carriage would begin to move, the speed of course rapidly increasing until it nearly equalled that of the train. The action of the spring could then be suspended by means of a break applied to the drum, and the newly-attached carriage would then attain a speed equal to that of the train, although at a considerable distance from it. There are various ways in which the carriage might be made to catch up the train, either by checking the speed of the engine at this point, or by manual labour in the carriage, or by both. When the carriage is coupled to the train, the new passengers would go to the body of the train, and those wishing to be set down at the next station would take their places in the rear carriage, which would then be cast off and another taken, and so on at every station. The practicability of this scheme would, I think, be determined by the answers to these two questions:—First, what is the maximum of speed at which the operation of hitching on would be possible? Secondly, what is the minimum of speed which would effect a saving of time considerable enough to make it worth while to adopt this plan? Now if the maximum in the one case equals or exceeds the minimum in the other, the scheme may be considered worthy of adoption. For my own part I can see no reason why the operation described should not be possible at a speed of from six to ten miles an hour—perhaps more; while, on the other hand, it appears to me that if it were possible at any speed—if only at two miles an hour, or even less, provided the train did not actually stop—the plan would be advantageous. I do not propose this system for general adoption, but only for a few miles out of London, where, in fact, the passenger-traffic on some lines, under the present plan, has almost grown unmanageable. Beyond that distance passengers could change into ordinary trains. With this slight sketch of my scheme, I leave it to the judgment of those of your readers who are conversant with the subject. For my own part I can only say that if it be impracticable, I should be glad to be convinced of this as quickly as possible.—I am, &c., James Rigby Smith.

Patents.

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From Commissioners of Patents Journal, October 13*th.*

Grants of Provisional Protection.

Balls, &c., of malleable iron or steel—2444—J. Player.
Billiard marker—2402—N. B. Thoyts
Blast furnaces, drawing off gases from—2507—J. and G. Addenbrooke, and P. A. Millward.
Bleaching, &c.—2501—W. Schofield and J. Smith.
Bobbin holders—2406—J. Goulding.
Boots and shoes—2410—H. Hibling.
Bracelets, &c.—2497—C. Giuliano.
Bricks, &c., manufacture of—2392—J. Gillespie.
Candlesticks—2513—A. Hill.
Carding engines, &c., cards used in—2432—W. Turner, S. Shore, and W. Halliwell.
Casks, &c., machinery for making—2426—J. Davidson.
Cement—2505 J. Duke.
Centrifugal pumps and fans—2489—A. Rigg.
Clasps or fastening—2525—F. Jenner.
Coffins-2459—J. Hargreaves.
Coffins—2495—S. Dunn.
Colouring matter, manufacture of—2424—A. Schultz.
Colouring matters, preparing—2335—J. Holliday.
Conductors for electro-telegraphic purposes—2416—W. Beggett.
Copper, &c., calcining—2350—T. and T. L. G. Bell.
Cotton press—1916—S. Boyd.
Drilling machines, tightening chucks for—2491—E. T. Hughes.
Drugs, &c., mixing or grinding—2290—T. C. Gibson.
Effluvium traps—2499—E. Cottam.
Engraving on metal—2388—R. A. Brooman.
Envelopes, fastening—2430—J. E. Tuchet.
Fire-arms and ordnance—2466—W. E. Newton.
Fire-arms, breech-loading—2452—A. Prince.
Fire-arms, breech-loading, and cartridges for—2438—W. E. Newton.
Grain, machines for binding—2422—J. Sheldon.
Guns in ships, mounting and working—2306—J. Walker.
Hay, &c., presses for—2454—A. V. Newton.
Heating, producing and combining gases for—2527—S. C. Salisbury.
Hoisting machines—2414—W. R. Lake.
Knickerbockers—2460—W. Ambler.
Liquids, &c., decomposing and superheating—2535—R. A. Brooman.
Locomotive engines, &c., arresting the motion of—1736—P. D. Finnigan.
Magnetic telegraphs—2356—W. Clark.
Metallic surfaces, coating—2480—J. Boffey and C. W. Smith.
Metal plates to beams, &c., fastening—2384—R. Fox.
Needles—2074—C. O. Crosby.
Paddle-wheel propellers—2374—A. J. Sedley.
Paddles and oars, feathering—2434—W. J. M. Rankine.
Paper—2472—G. Eveleigh.
Paper bags and envelopes—2420—H. Rankin.
Paraffine, lamps for burning—2545—L. Hewitt.
Perfumes, &c., apparatus for distributing—2340—J. Dunbar and J. W. Butler.
Petroleum, &c., lamps for burning—2487—J. Maublanc.
Pipes, preventing leakages in—2503—C. F. Cotterill.
Planing wood, &c., bench stops for—2539—J. Heydon.
Portfolios and paper files—2468—G. T. Bousfield.
Presses, steam and hydraulic—2447—W. Routledge & F. F. Ommanney.
Punkahs—2148—J. E. Marsh.
Purses, &c., fastening for—2347—D. and J. Hyam.
Railway carriage doors, locking and unlocking—2442—J. H. Simpson.
Railway carriages, retarding the velocity of—1710—H. Shaw.
Railways and wheels for railways—2408—A. V. Newton.
Railways, permanent way of—2256—W. Clark.
Railways, signalling on—2474—A. Moore.
Rivets, &c., machinery for making—2353—J. Lewis.
Saddles and harness—2366—W. Clark.
Safes, &c.—2294—J. M. Hart.
Saltpetre, artificial—2142—I. Bernhard.
Scarfs, cravats, and ties—2046—W. and G. Crosher.
Screw wrenches—2396—H. A. Dufrené.
Securing tubes in tube plates, tools for—2455—R. T. N. Howey.
Sewers, &c., apparatus for ascertaining state of—2446—R. W. Barnes.
Sewing machines—2431—E. T. Hughes.
Sick rooms, lighting and heating—2515—J. H. Johnson.
Socks for boots and shoes—2428—C. and T. White.
Springs—2462—W. H. Brown.
Steam engines and valves—2286—W. Clark.
Textile and other substances, liquid composition for cleansing, &c.—2440—G. E. and E. L. Rolland.
Turning grate, fire-place—2298—A. Duvernois.
Vehicles, communicating between occupiers and drivers of—2400—E. Petito.
Washing and wringing machines—2478—R. A. Brooman.
Washing, &c., machinery for—2450—G. F. Smeeton.
Watches—2330—D. Keys.
Weaving, looms for—2543—J. Wadsworth, T. Hall, and S. Bonser.
Weft winding machines—2519—W. Longbottom.
Wool, &c., combing—1664—J. Busfield and S. B. Walmsley.
Wool, &c., machinery for carding—2533—C. Walker and W. Preston.
Wool, &c., preparing machinery for working—2517—W. E. Newton.

Inventions with Complete Specifications Filed.

Skins for tanning and currying, preparing—2585—H. A. Bonneville.

Patents Sealed.

1062. R. A. Brooman.
1066. J. M. Courtauld.
1068. W. Clark.
1071. A. Henry.
1072. T. Newbigging & A. Hindle.
1074. L. de St. Céran.
1076. J. Dougan.
1079. F. C. Bakewell.
1081. J. J. Jenkins.
1083. W. Bedd r.
1088. R. A. Jones and J. Hedges.
1093. M. Vogl.
1096. H. K. Taylor.
1102. F. A. Abel.
1103. W. Hale.
1105. W. Beaven.
1106. W. Robinson.
1129. C. J. and J. A. Keenan.
1137. H. A. Bonneville.
1144. W. Clark.
1155. J. Wilkinson.
1158. J. T. Bucknill.
1160. W. Oxley.
1161. W. Clark.
1177. J. Carr.
1204. F. Gregory.
1272. J. H. Johnson.
1286. J. H. Johnson.
1301. W. J. Rice.
1372. T. Molden, J. Newsome, and J. Akeroyd.
1626. H. A. Bonneville.
1650. G. Clark.
1748. W. R. Lake.
1776. J. Jobson and J. F. Dickson.
1782. G. Carter.
1838. T. C. McKeen.
1846. H. A. Bonneville.
1953. R. B. Mitchell.
2203. H. A. Bonneville.
2204. H. A. Bonneville.

From Commissioners of Patents Journal, October 17*th.*

Patents Sealed.

1087. R. A. Brooman.
1099. M. Houssepian.
1100. T. Hampton and J. Abbott.

Patents on which the Stamp Duty of £50 has been Paid.

2735. J. Lowe and J. Harris.
2744. R. A. Brooman.
2756. C. Thomas.
2762. F. G. Grice.
2767. C. Harratt.
2749. A. V. Newton.
2785. F. F. Prud'homme.
2813. B. Lauth.
2777. W. Wilson.
2789. E. A. Cowper.
2789. H. Ransford.
2836. G. T. Bousfield.

Patents on which the Stamp Duty of £100 has been paid.

2270. L. Wray.
2258. J. Saxby.
2259. J. Beattie.
2274. G. Beadon.
2307. G. F. Wilson.
2344. T. Twells.
2284. J. and J. Braby.
2291. T. Ingram.

Registered Designs.

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A Table Cloth or Cover—October 2—4745—Anna Pope, 4, Bulstrode-street, W.
Writing Cabinet—October 2—4746—W. Mitchell, 76, Cannon-street, City, E.C.
Cistern Ball—October 6—4747—W. E. Tilley, 6, Kirby-street, Hatton-garden, E.C.
Improved Stay Busk—October 13—4748—J. Ellis, jun., Bristol.
A Self-fastening Grid or Cover—October 16—4749—G. Shorland and J. Bushell, Manchester.